


UCID- 20126

**CIRCULATION COPY
SUBJECT TO RECALL
IN TWO WEEKS**

**A SAFETY ANALYSIS OF THE NUCLEAR CHEMISTRY
BUILDING 151**

Don Kvam

June 29, 1984



**Lawrence
Livermore
National
Laboratory**

This is an informal report intended primarily for internal or limited external distribution. The opinions and conclusions stated are those of the author and may or may not be those of the Laboratory.

Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore Laboratory under Contract W-7405-Eng-48.

DISCLAIMER

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government thereof, and shall not be used for advertising or product endorsement purposes.

Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
Price: Printed Copy \$; Microfiche \$4.50

<u>Page Range</u>	<u>Domestic Price</u>	<u>Page Range</u>	<u>Domestic Price</u>
001-025	\$ 7.00	326-350	\$ 26.50
026-050	8.50	351-375	28.00
051-075	10.00	376-400	29.50
076-100	11.50	401-426	31.00
101-125	13.00	427-450	32.50
126-150	14.50	451-475	34.00
151-175	16.00	476-500	35.50
176-200	17.50	501-525	37.00
201-225	19.00	526-550	38.50
226-250	20.50	551-575	40.00
251-275	22.00	576-600	41.50
276-300	23.50	601-up ¹	
301-325	25.00		

¹Add 1.50 for each additional 25 page increment, or portion thereof from 601 pages up.

SAFETY ANALYSIS OF BUILDING 151

ABSTRACT

This report summarizes the results of a safety analysis that was done on Building 151. The report outlines the methodology, the analysis, and the findings that led to the "low hazard" classification. No further safety evaluation is indicated at this time.

INTRODUCTION

Building 151 is administered by the Nuclear Chemistry Department. This department develops and applies radiochemical techniques to conduct a broad range of analytical measurements and scientific studies in support of Laboratory programs. Table 3 of this report lists the functions of all the individual laboratories in the building.

A group was formed to evaluate Bldg. 151 from the viewpoint of DOE Order 5481.1A, Safety Analysis and Review System. This order calls for a detailed formal safety analysis if the facility has the potential for causing "considerable" impacts on people or the environment. The purpose of this study was to determine if major impacts were credible and if further safety analysis was required.

The analysis group, managed by W. L. Eneidi, consisted of S. G. Leeds, Fire Safety; G. E. Costella, Industrial Hygiene; C. D. Burgin, Industrial Safety; D. J. Kvam, Safety Analysis; T. Straume and S. Homann, Health Physics; M. Dreicer, Environmental Evaluations; and R. J. Dupzyk, Facility Manager.

METHODOLOGY

Reviewing the areas of their particular discipline, each member of the review group inspected the facility so that they could assure the following:

- o All identifiable hazards were controlled or mitigated.
- o There was reasonable assurance that the facility was operated in a manner that would preclude undue risks to the health and safety of the public and employees, and that property and the environment were adequately protected.

The enclosed Tables 1 and 2 list some of the hazardous elements found in the building and make a qualitative assessment of their risk. Table 1 is composed of generic hazards, such as coming in contact with electricity or falling. These are hazards that are common to almost all facilities and are recognized and accepted by the general public. They are included here to assure the reader that the safety analysis examined all potentially hazardous energy sources. Table 2 lists some of the more esoteric hazards found in the building. It is difficult to conceive of a situation where these hazards threaten the life of more than one person. While an individual in the facility could be seriously injured, no element projected a significant impact on people outside the building or the environment and, therefore, the facility was categorized as low hazard. "Low" being an activity that presents minor on-site (outside Building 151) and negligible off-site impacts to people or the environment.

MAXIMUM CREDIBLE ACCIDENT

The maximum credible accident which could contribute to both on-site and off-site consequences was determined to be a major fire involving chemicals or radioactive materials. Table 3 lists the radioactive materials which could contribute to an atmospheric dispersion should they be involved in the postulated fire. If this entire inventory is released, radiological impact on-site and off-site is well below the exposure standards given by the Department of Energy in DOE Chapter 0531. (See Table 4.)

Table 5 is the storeroom stock list at Building 151. Assuming a storeroom fire lasting 20 minutes and resulting in 50% of the inventory being released from the building, the rate would be 6.8×10^5 mg/sec airborne. This would result in a fence line concentration of 884 mg/m³. Assuming that the mixture of the chemicals and their combustion products has a moderate toxicity level, the short term (15 minutes) exposure limit is approximately 1-2 mg/m³. Clearly, an individual downwind from the postulated fire for a period of time could be injured to some degree.

It should also be noted that an individual immediately downwind from any fire will probably suffer some damage in the form of irritation, chronic or irreversible tissue change, or narcosis of a sufficient degree to impair self-rescue. The point being that Building 151 presents no unique hazard. The hazards from fire are recognized by the public and as we do with the automobile, we "live with it." Hazards recognized and accepted by the public are beyond the scope of the DOE Order 5481.1A.

FIRE ANALYSIS

Since fire is a part of the maximum credible accident, it is appropriate to discuss fire protection and what the maximum probable fire involves. Building 151 is a fire-resistive masonry structure with no nearby buildings and is protected by a fully supervised automatic wet-pipe sprinkler system. In addition to automatic fire protection and detection systems, the building has portable fire extinguishers placed throughout for the use of building occupants. Fire Department response time is approximately three minutes after the receipt of an alarm or request for aid.

The above mentioned conditions would limit the maximum probable fire to a \$5-10K loss.

CONCLUSION

While this investigation has determined that Building 151 is a low hazard facility and therefore no further analysis is indicated, this should not be interpreted to mean that safety will be neglected. The facility employs a full-time safety person and is routinely visited by the safety discipline specialists of Hazards Control Team 4. The people working in Building 151 and their managers have the main responsibilities for safety and they employ a variety of techniques for assuring the continuance of a good safety record. For example, the reader is referred to the Facility Safety Procedures. This document gives details concerning the building, its operation, its hazards and controls, and lists the responsible individuals.

TABLE 1: Hazards Common to Most Facilities

PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

<u>ITEM</u>	<u>HAZARDOUS ELEMENT</u>	<u>SUBSYSTEM OR COMPONENT</u>	<u>OPERATIONAL MODE</u>	<u>EVENT CAUSING HAZARDOUS CONDITION</u>	<u>HAZARDOUS CONDITION</u>	<u>POTENTIAL ACCIDENT</u>	<u>EFFECTS</u>	<u>ACCIDENT SEVERITY</u>	<u>ACC. PROB.</u>	<u>MITIGATING/ PREVENTATIVE ACTION</u>
1	Falling objects	Building and Equipment	All	Earthquake	Structural Defect	Structural Failure(s))	Fatalities and equip- ment damage	I	L	Adequate design for earthquake loading; employee training.
2	Gravity Hoists	Material	Operating	Rigging Failure	Falling Load	Load Strikes personnel	Injury Material Damage	II	L	Adequate equipment design; employee training.
3	Gravity	Walking/ Working	Operating	Slip/Trip/ Fall	Obstruction slip hazard on stairs, ladder, walkway.	Employee falls	Injury	II	M	Design applicable & standards; good housekeeping; employee training.
4	Gravity	Elevators	Operating	Hydraulic Equipment Failure	Equipment Defect	Crane Cab Falls	Fatality Injury Equipment Damage	I	U	Design to applicable code. Inspection/ maintenance repairs.
5	Rotating Parts	Power Machine Tools	Operating	Employee caught on rotating part	Clothing/ body part too close to rotating part	Rotating part strikes employee	Injury	II	M	Use of hand tools to feed materials into machine. Loose clothing, hair. Employee training.

TABLE 1
(continued)

PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

<u>ITEM</u>	<u>HAZARDOUS ELEMENT</u>	<u>SUBSYSTEM OR COMPONENT</u>	<u>OPERATIONAL MODE</u>	<u>EVENT CAUSING HAZARDOUS CONDITION</u>	<u>HAZARDOUS CONDITION</u>	<u>POTENTIAL ACCIDENT</u>	<u>EFFECTS</u>	<u>ACCIDENT SEVERITY</u>	<u>ACC. PROB.</u>	<u>MITIGATING/ PREVENTATIVE ACTION</u>
6	V Belt Gears	Power Equipment	Operating	Employee caught on on rotating	Exposed V belt or gear	Rotating part	Injury	II	L	Guard per applicable codes and standards. Employee training.
7	Rotating part	Centri- fuges	Operating	Rotor Failure	Defect in rotor	Shrapnel strikes employee	Injury, Property Damage	II	U	Shielded design. Rotors run at low speeds.
8	Pressure	Compressed Gas Cylinders	Operating or Stored	Cylinder falls/ struck by object	Valve damage or failure	Shrapnel strikes employee	Injury, Property Damage	II	L	Cylinders secured. Storage in tow traffic areas. Personnel training.
9	Pressure	Pressur- ized lines & Fittings	Operating	Over- Pressur- ization	Line/ Fitting/ Defect/ Failure.	Shrapnel strikes employee	Injury, Property Damage	II	L	Design and review testing and certifi- cation. Relief devices. Employee training.
10	Flammable and/or inert gases	Building utility piping.	Operating	Earthquake	Pressur- ized line breaks/ fails.	Fire or O ₂ defi- ciency	Fatality, Injury, Property Damage	I	U	Earthquake shut off valves on house lines. Design and review certification and testing.

TABLE 1
(continued)

PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

<u>ITEM</u>	<u>HAZARDOUS ELEMENT</u>	<u>SUBSYSTEM OR COMPONENT</u>	<u>OPERATIONAL MODE</u>	<u>EVENT CAUSING HAZARDOUS CONDITION</u>	<u>HAZARDOUS CONDITION</u>	<u>POTENTIAL ACCIDENT</u>	<u>EFFECTS</u>	<u>ACCIDENT SEVERITY</u>	<u>ACC. PROB.</u>	<u>MITIGATING/ PREVENTATIVE ACTION</u>
11	UV radia- tion	Welding, soldering, brazing	Operating	Normal operation	Employee not wearing protective	Employee exposed to UV radia- tion equip.	Injury	III	L	Separate welding area personal protective equip- ment. Employee training.
12	Electrical	General Building 110/220 V circ.	Operating	Employee Working on live circuit	Exposed Wiring/ voltage	Electric shock	Fatality Injury	I	L	Design to codes. Lock and tag procedure. Employee training.
13	Electrical	Outlets near sinks	Operating	Employee working with water	Wet hands or contact- ing wet area while working with elect- rical equip.	Electric shock	Injury Fatality	I	U	GFI's installed on all outlets near testing sinks. Employee training.
14	Electrical	Elevator Power Supplies	Operating	Mainten- ance testing of live circuit	Exposed live terminals contacts, etc.	Electric shock	Injury Fatality	I	L	Restricted access. Well enclosed design. Employee training.

TABLE 1
(continued)

PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

<u>ITEM</u>	<u>HAZARDOUS ELEMENT</u>	<u>SUBSYSTEM OR COMPONENT</u>	<u>OPERATIONAL MODE</u>	<u>EVENT CAUSING HAZARDOUS CONDITION</u>	<u>HAZARDOUS CONDITION</u>	<u>POTENTIAL ACCIDENT</u>	<u>EFFECTS</u>	<u>ACCIDENT SEVERITY</u>	<u>ACC. PROB.</u>	<u>MITIGATING/ PREVENTATIVE ACTION</u>
15	Electrical	Battery Supply	Operating	Object falls across terminals of battery	Shorted battery terminals	Electric shock	Injury, Property Damage	II	L	Restricted access. Use of insulated tools only in area. Employee training.
16	Hydrogen Gas	Battery Supply	Operating	Hydrogen ----	Flammable gas mix- ture of hydrogen and air	Hydrogen fire	Injury, Property Damage	II	L	Ventilation.

TABLE 2: Unusual Hazards

PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

<u>ITEM</u>	<u>HAZARDOUS ELEMENT</u>	<u>SUBSYSTEM OR COMPONENT</u>	<u>OPERATIONAL MODE</u>	<u>EVENT CAUSING HAZARDOUS CONDITION</u>	<u>HAZARDOUS CONDITION</u>	<u>POTENTIAL ACCIDENT</u>	<u>EFFECTS</u>	<u>ACCIDENT SEVERITY</u>	<u>ACC. PROB.</u>	<u>MITIGATING/ PREVENTATIVE ACTION</u>
1	Cryogenic fluids	Cryogenic tanks dewars	Transfer	Spill	Spilled cryogenic fluid	Spilled fluid splashes employee	Thermal burn	III	M	Personal protective equipment. Employee training.
2	Cryogenic fluids	Cryogenic vessels & piping	Operating	Over-pressure	Equipment defect/failure	Shrapnel strikes employee	Fatality Injury Property Damage	I	U	Shielding. System design and review, pressure reliefs inspection and maintenance.
3	Cryogenic fluids	LN, LOX, LAR tanks	Operating	Earthquake	Cryogenic tank failure	Spilled fluid, O ₂ deficiency, Thermal effect	Fatality Injury Property Damage	I	U	Remote location, design for earthquake loading
4	rf radiation	rf heating coils	Operating	Employee removes shielding	Unshielded coil	Employee in rf field	Injury thermal burns	III	L	Shielding inspection/monitoring. Employee training.
5	microwave radiation	Microwave Ovens	Operating	Door, screen damaged	Unshielded microwave field	Employee in rf field	Injury thermal	III	L	Inspection/monitoring. Employee training.

TABLE 2
(continued)

**PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION**

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

<u>ITEM</u>	<u>HAZARDOUS ELEMENT</u>	<u>SUBSYSTEM OR COMPONENT</u>	<u>OPERATIONAL MODE</u>	<u>EVENT CAUSING HAZARDOUS CONDITION</u>	<u>HAZARDOUS CONDITION</u>	<u>POTENTIAL ACCIDENT</u>	<u>EFFECTS</u>	<u>ACCIDENT SEVERITY</u>	<u>ACC. PROB.</u>	<u>MITIGATING/ PREVENTATIVE ACTION</u>
6	Toxic and Corrosive Compressed Gases	Chem Lab	Operating	System Failure Regulatory ----- -----	Release of Toxic/Corrosive gas to work area	Employee inhalation/skin exposure. Fire. Explosion.	Injury Fatality Property Damage	II	L	Training procedures Engineering controls Personal protective equipment
7	Chemical	Building and Equipment	Operating or non-operating	Earthquake	Falling Breaking Chemicals	Thermal/Chemical Burns, Toxic gases. Explosion.	Injury Fatality Property Damage	II	L	Training procedures. Engineering controls. Personal protective equipment.
8	Chemicals	Fume hood and ventilated	Operating	Exhaust Ventilation Failure. Loss of Electrical power.	Release of Toxic/Corrosive Vapors and Gases	Inhalation of Toxic/Corrosive Chemicals	Injury Illness	III	L	Training procedures Engineering controls.

TABLE 2
(continued)

PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

ITEM	HAZARDOUS ELEMENT	SUBSYSTEM OR COMPONENT	OPERATIONAL MODE	EVENT CAUSING HAZARDOUS CONDITION	HAZARDOUS CONDITION	POTENTIAL ACCIDENT	EFFECTS	ACCIDENT SEVERITY	ACC. PROB.	MITIGATING/ PREVENTATIVE ACTION
9	Radiation	X Ray	Operating	Scattering of X Rays	Hand in Beam	X-Ray Burn 30,000 R/min	Injury	II	L	Shielding, inter- locks, warning devices, training, procedures, infrequent use.
10	Radiation	Glove Boxes	Operating	Transfer In/Out	Spill	Lung Dose	Injury	III	L	Training, proce- dures, respirators, protective clothing, alarms, short time at risk.
11	Radiation	Glove Boxes	Operating	Penetrating Radiation	Propin- quity	Whole Body Exposure, Hand Exposure	Injury	IV	M	Shielding, Dosi- meters, meters, training, procedures.
12	Reactive Chemicals	Fume Hoods, Glove Boxes and Labs	Operating	Unwanted Rapid Chemical Reactions	Chemical Splash, Heat/Fire Explosion	Chemical/ Thermal Burns, Shrapnel	Injury, Fatality, Property Damage	II	M	Training procedures, engineering controls, personal protective equipment.

TABLE 2
(continued)

PROBABILITY OF ACCIDENT
ASSUMING PREVENTIVE ACTION

H - High
M - Moderate
L - Low
U - Unlikely

ACCIDENT SEVERITY

I. Death/Catastrophic Damage
II. Major Equipment Damage/Major Injury
III. Minor Equipment Damage/Minor Injury
IV. Insignificant Damage

<u>ITEM</u>	<u>HAZARDOUS ELEMENT</u>	<u>SUBSYSTEM OR COMPONENT</u>	<u>OPERATIONAL MODE</u>	<u>EVENT CAUSING HAZARDOUS CONDITION</u>	<u>HAZARDOUS CONDITION</u>	<u>POTENTIAL ACCIDENT</u>	<u>EFFECTS</u>	<u>ACCIDENT SEVERITY</u>	<u>ACC. PROB.</u>	<u>MITIGATING/ PREVENTATIVE ACTION</u>
13	Toxic Chemicals	Chemistry Labs	Operating	Chemical Spill	Personnel Exposure to Toxic Chemicals	Inhalation or Skin Absorption	Injury, Property	II	M	Training procedures, engineering controls, personal protective equipment.

Table 3. Building 151 Operations Involving Radioactive Materials

Room Number	Constant Air Monitoring	Operation	Activity Used* (Ci)
1033	Yes	Rare earth extraction (mixed fission products)	0.1
1034W	Yes	Glass bead leaching (waste isolation project)	10 ⁻⁹
1034E	Yes	Electron microscope Low level sample prep.	10 ⁻⁶
1039	Yes	Aliquot room and storage of historical samples (mixed fission products)	1
1041	Yes	Historical sample storage (mixed fission products)	1
1043	Yes	Shot sample dissolving (mixed fission products)	1
1043A	Yes	Shot sample storage (mixed fission products)	1
1101	Yes	Light chemistry + storage	10 ⁻⁶
1121A	No	Mass spectroscopy	10 ⁻⁶
1121B	No	Mass spectroscopy	10 ⁻⁶
1127	No	Sample preparation for mass spectroscopy	10 ⁻⁶
1131A	No	Mass spectroscopy (gas)	10 ⁻⁶
1131B	No	Mass spectroscopy	10 ⁻⁶
1143	No	Gas analysis (fission products)	10 ⁻³
1143B	No	Gas sample storage (fission products)	10 ⁻³
1318 North	Yes	General mass spectroscopy	10 ⁻⁶

*"Order of magnitude" estimates of the maximum activity present in these locations.

Table 3. Building 151 Operations Involving Radioactive Materials (Continued)

Room Number	Constant Air Monitoring	Operation	Activity Used (Ci)
1318 South	Yes	Volitilizer (heavy elements) Tracer Storage (heavy elements)	10 ⁻⁹ 10 ⁻⁶
1322	Yes	TRU shot sample chemistry (transuranic elements)	10 ⁻⁶
1326	Yes	Shot sample chemistry + tracer experiments with heavy elements	10 ⁻⁹
1330	Yes	Shot sample chemistry (transuranic elements)	10 ⁻⁹
1334	Yes	Gadolineum chemistry	10 ⁻⁶
1334B	Yes	Low level actinide analysis for isolation project-- radionuclide migration	10 ⁻¹²
2103 North	Yes	Initial separation for shot sample chemistry (mixed fission products)	10 ⁻³
2103 South	Yes	Shot sample chemistry (fission products)	10 ⁻³
2107	No	Bioassay (Hazards Control)	10 ⁻⁶
2109	Yes	Shot sample chemistry (fission products)	10 ⁻³
2117	Yes	Shot sample chemistry (fission products)	10 ⁻³
2121A	Yes	Sample weighing (mixed fission products)	10 ⁻³
2121	Yes	Shot sample chemistry	10 ⁻⁶
2125	Yes	X-ray fluorescence -- sealed sources + irradiated foil storage	10 ⁻⁹
2131	No	Rock leaching experiment -- "synrock" with D-38	10 ⁻⁹
2131A	No	X-ray fluorescence analysis	10 ⁻⁹

Table 3. Building 151 Operations Involving Radioactive Materials (Continued)

Room Number	Constant Air Monitoring	Operation	Activity Used (Ci)
2133	No	Detector studies	10^{-9}
2135	No	Environmental sample preparation	10^{-9}
2143	No	Environmental	10^{-9}
2144	No	sample preparation and	
2147	No	chemistry (^3H)	
2149	No	Environmental sample	10^{-9}
2150	No	chemistry (Pu, U, Cs)	
2302A	Yes	Shot chemistry Source preparation (fission products)	10^{-3}
2302B	Yes	Sample weighing (fission products)	10^{-3}
2308	Yes	Shot chemistry (rare earth elements)	10^{-4}
2312	Yes	Shot chemistry (rare earth elements)	10^{-4}
2318	Yes	Shot chemistry and Os and Re chemistry	10^{-4}
2322	Yes	Shot chemistry and Os and Re chemistry	10^{-4}
2326	Yes	Shot chemistry and Osmium chemistry	10^{-4}
2330	Yes	Shot chemistry and Os, Re, and Nb chemistry	10^{-4}
B-114	Yes	GeLi counting room	10^{-9}
B-120A	No	Radioactive materials storage (fission products)	10^{-3}

Table 3. Building 151 Operations Involving Radioactive Materials (Continued)

Room Number	Constant Air Monitoring	Operation	Activity Used (Ci)
B-120	No	Counting rooms (fission products)	10 ⁻³
B-122	No		
B-124	No		
B-126	No		
B-128	No		
B-130	No		
B-132	No		

TABLE 4. Impact of Accidental Radionuclide Release from Building 151

<u>Situation</u>	<u>Dose/Distance</u>
RADIONUCLIDE FIRE	D = 0.1 KM 50-YR DOSE COMMITMENT: -----
Y-91: 7.50-01 CURIE INHALATION CLASS: Y RELEASE FRAC.= 1.00+00 FILTER FACT.= 1.00+00 -----	LUNG***** 4.63+00 REM EQUIVALENT WHOLE-BODY** 586.-03 REM
ZR-95: 8.50-01 CURIE INHALATION CLASS: Y RELEASE FRAC.= 1.00+00 FILTER FACT.= 1.00+00 -----	D = 0.2 KM 50-YR DOSE COMMITMENT: -----
NB-95: 1.40+00 CURIE INHALATION CLASS: Y RELEASE FRAC.= 1.00+00 FILTER FACT.= 1.00+00 -----	LUNG***** 1.35+00 REM EQUIVALENT WHOLE-BODY** 171.-03 REM
CE-144: 1.00+00 CURIE INHALATION CLASS: Y RELEASE FRAC.= 1.00+00 FILTER FACT.= 1.00+00 -----	D = 0.5 KM 50-YR DOSE COMMITMENT: -----
PR-144: 1.00+00 CURIE INHALATION CLASS: Y RELEASE FRAC.= 1.00+00 FILTER FACT.= 1.00+00 -----	LUNG***** 279.-03 REM EQUIVALENT WHOLE-BODY** 35.3-03 REM
FIRE REV-04/05/84 STABILITY = D WIND SPEED = 2.0 M/S RELEASE HEIGHT = 0 M	D = 1.0 KM 50-YR DOSE COMMITMENT: -----
	LUNG***** 87.7-03 REM EQUIVALENT WHOLE-BODY** 11.1-03 REM
	D = 2.0 KM 50-YR DOSE COMMITMENT: -----
	LUNG***** 28.5-03 REM EQUIVALENT WHOLE-BODY** 3.61-03 REM
	D = 5.0 KM 50-YR DOSE COMMITMENT: -----
	LUNG***** 6.88-03 REM EQUIVALENT WHOLE-BODY** 861.-06 REM

SARS DOCUMENTATION FORM

NOTE: This form is designed to record the safety analysis review process required by DOE 5481.1A

1. SAFETY ANALYSIS DOCUMENT TITLE AND DATE: A Safety Analysis of the Nuclear Chemistry Building 151 June 29, 1984

2. THIS DOCUMENT DESCRIBES:

- ☐ NEW FACILITY ☒ EXISTING FACILITY ☐ ENTIRE PROGRAM
☐ MAJOR MODIFICATION

3. DOE 5481.1A HAZARD CLASSIFICATION

- ☐ HIGH ☐ MODERATE ☒ LOW ☐ EXCLUDED

4. CONTRACTOR LLNL

☒ Approval of Safety Documents

☐ Authorization to Operate
New/Modified Facility

Charles E. ...
Reviewed by:

R. W. Kuchuk
Approved by:

7/9/84
Date

Date

5. FIELD OFFICE

☐ Concurrence with Attached Safety Documents

☐ Authorization to Operate
New/Modified Facility

Reviewed by:

Line Program Official

Date

Date

6. H. Q. PROGRAM OFFICE

☐ Concurrence with Attached
Safety Documents

☐ Authorization to Operate
New/Modified Facility

Reviewed by:

Line Program Official

Date

Date

TABLE 5. Stockroom Chemicals (liters)

<u>Description</u>	<u>Qty</u>	<u>Description</u>	<u>Qty</u>
1 4-Dioxane Reagent 1 Pt	2	Isopropyl Alcohol Purif	18
Acetic Acid Glacial	2	Isopropyl Ether Reagent 2 PT	2
Acetone Reagent	48	K Dichromate Reagent	2
Alcohol Absol 200P 1 Pt	24	K Hydroxide R Pellets	2
Aluminum Nitrate	6	K Phosphate Monobasic	2
Aluminum Potas Sulfate	2	Magnesium Chloride 1 =	2
Ammonium Chloride 1=	2	Mercury Hi Purity 5 lb	2
Ammonium Hydroxide	12	Methanol Reagent	48
Ammonium Nitrate	8	Nickel Metal Powder	2
Ammonium Sulfate	2	Nitric Acid Fuming R	2
Ammonium Sulfide	2	Nitric Acid Reagent	60
Ascarite 8-20 Mesh	2	Oxalic Acid Reagent	2
Ascorbic Acid Reagent	2	Pentane Tech 2 KG size	2
Barium Nitrate Reagent	2	Perchloric Acid 70(1 =	24
Benzene Reagent	2	Perchloric Acid 8 lb	2
Boric Acid Reagent 1=	2	Petroleum Ether R 30	2
Bromine Reagent 1/4 =	2	Phosphoric Acid Reagent	2
Buffer Solution 4 PH	2	Potassium Chloride 1:	2
Buffer Solution 7 PH	2	Potassium Iodide 1 =	2
Cal Chloride ANHY 12	2	Potassium Nitrate	2
Calcium Carbonate	2	Potassium Pyrosulfate	2
Carbon Disulfide	2	Rubidium Chloride	2
Carbon Tetrachloride	6	Silver Nitrate 1/4 =	2
Cesium Chloride Purif	2	Soda Baking Arm & Hammer	6
Charcoal Active 80 Mesh	2	Sodium Bicarbonate USP	3
Chloroform Reagent	2	Sodium Borate Reagent	2
Chloroform Reagent 8 pt	2	Sodium Carbonate AN R	2
Copper Metal Powder	2	Sodium Chloride R 1 =	9
Cupric Sulfate Reagent	2	Sodium Dichromate R 1 =	2
Ether ANHY Reagent 1=1b	2	Sodium Hydroxide 1 N =	6
Ether U.S.P. 1/4 lb sz	2	Sodium Hydroxide 50 sol	48
Ethyl Acetate ANHY	3	Sodium Hydroxide R 1 =	2
Ethyl Alcohol 190 p 1 gl	2	Sodium Hydroxide R 5 =	20
Ethylene Dichloride	2	Sodium Metabisulfate R	2
Ethylene Glycol 1 KG	2	Sodium Peroxide 1/4 =	2
Ferric Chloride Reagent	2	Strontium Nitrate ANHY	2
Fluoboric Acid	2	Sucrose Reagent	24
Glycerol Reagent	2	Sulfur Precipitated	2
HCL Acid Reagent	60	Sulfuric Acid R 9 =	2
HCL Acid Reagent Pt	18	Sulfuric Acid Reagent	12
HCL Solution 1 Normal	2	Sulfurous Acid Reagent	3
HYD-Amin Hydrochloride	2	Tartaric Acid R	2
Hydrobromic Acid	2	Toluene Reagent	6
Hydrofluoric Acid	36	Xylene Reagent	2
Hydrogen Peroxide 3 Pct	6	Zinc Sulfate Reagent	2
Hydrogen Peroxide 30 P	24		